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Introduction

Conventional contact mapping of atypical atrial flutter requires a high density of contact electrograms. Non-contact, global, dipole density mapping partly obviates the technical skill needed for high density contact mapping. Dipole density derives the local charge sources on the surface from intracavitary voltage, an approach that should minimize far-field effects. We assessed atypical flutter mapping using a novel ultrasound basket catheter able to perform dipole density non-contact mapping.

Methods

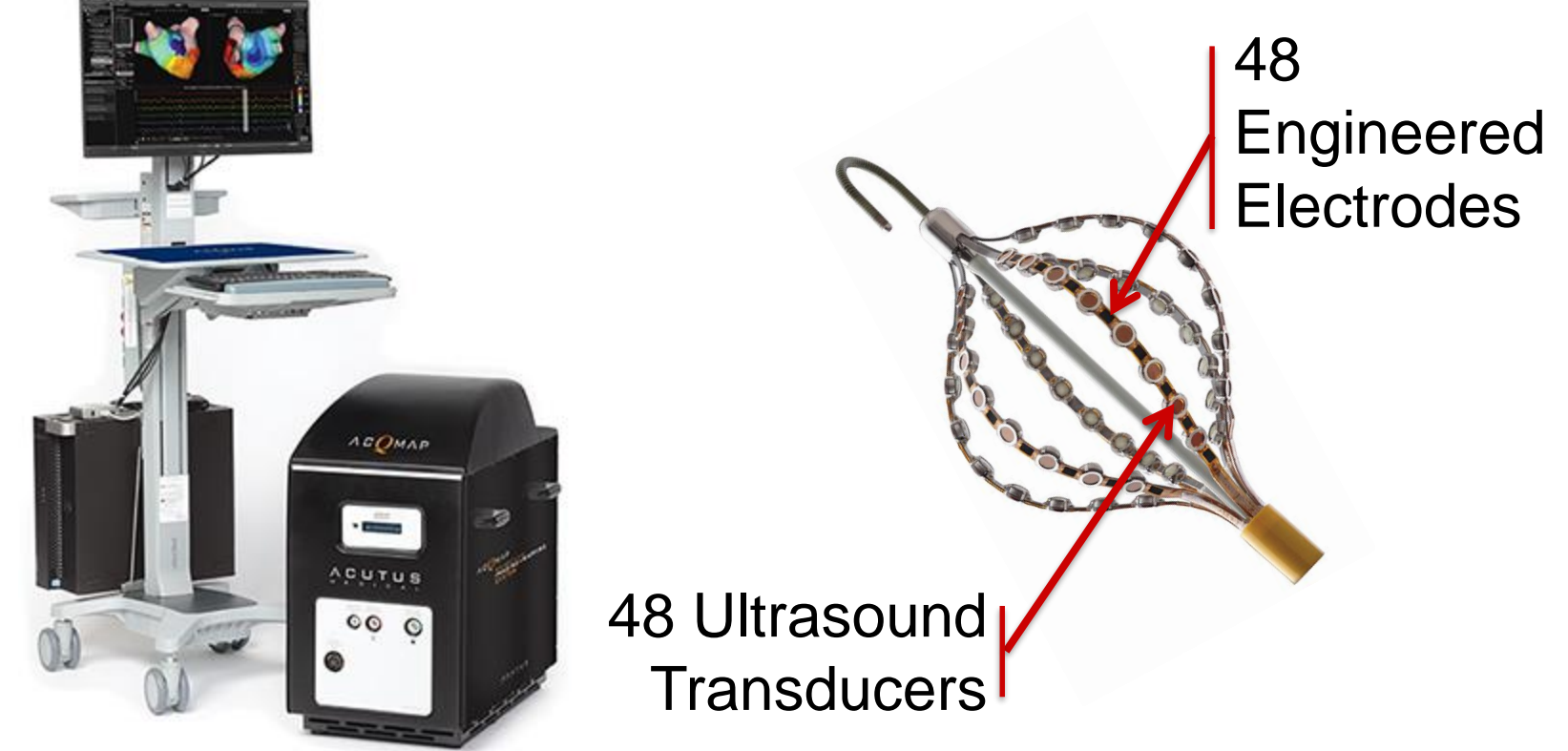
The AcQMap system (Acutus Medical Inc) employs a basket catheter [25 mm diameter, 48 ultrasound transducers (m-mode), 48 engineered electrodes] that rapidly acquires i) endocardial ultrasound distances to render 3D left atrial anatomy, and ii) bio-potential data for rapid far-field mapping. An inverse solution is used to calculate the dipole density from the voltages measured on the basket. The calculated data is spatially and temporally applied to the final processed surface anatomy as either a depolarization or propagation history map. In a depolarization map the red region depicts the negative phase of dipole density and when animated is associated with propagation of depolarization. In the propagation history map, red represents the leading edge of the activation wave front with the trailing color bands showing earlier locations of the wave front.

Dipole density and voltage non-contact maps were compared to available conventional voltage contact maps for correlation and ability to map each flutter activation pattern encountered.

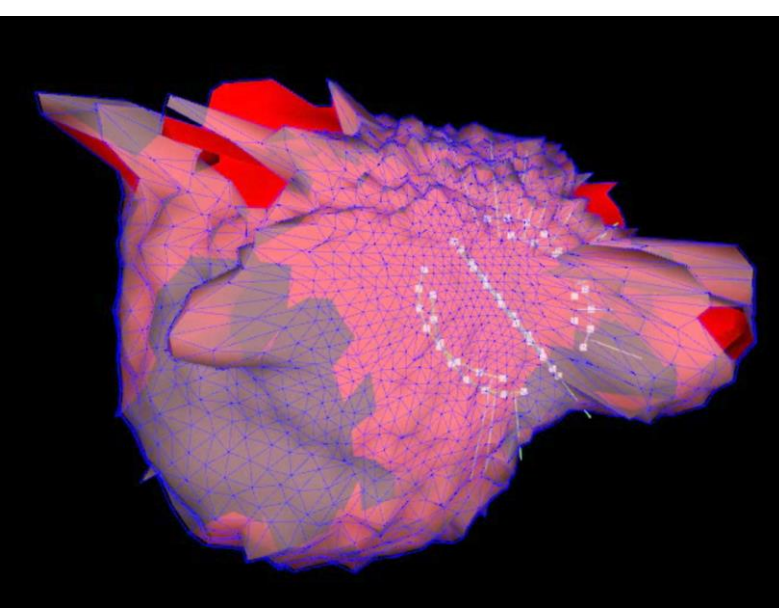
Disclosures

Vivek Reddy, MD: Acutus Medical: Stock Options
 Petr Neuzil, MD PhD: Acutus Medical: Grant Support

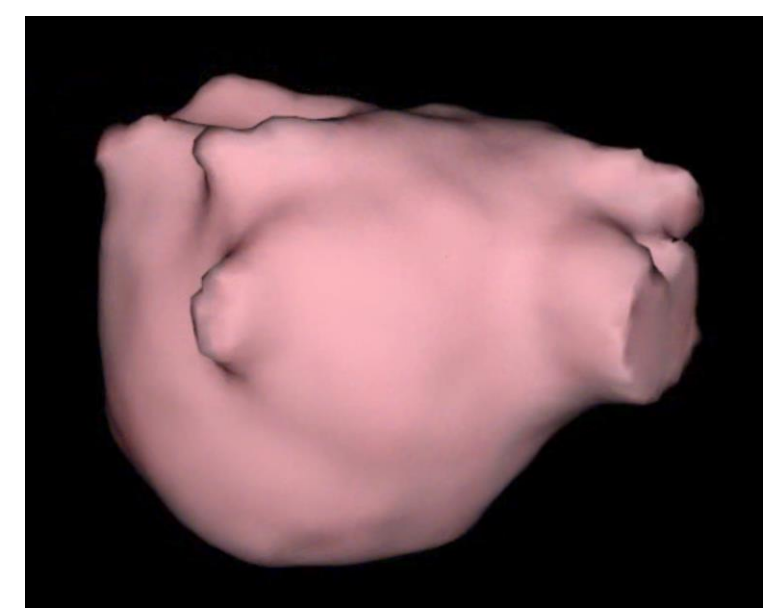
AcQMap™ System



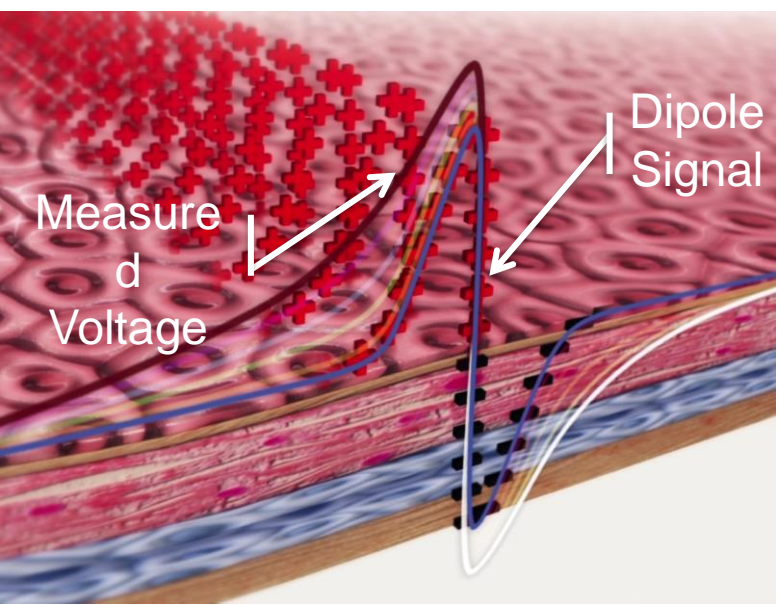
Console and Workstation AcQMap Catheter



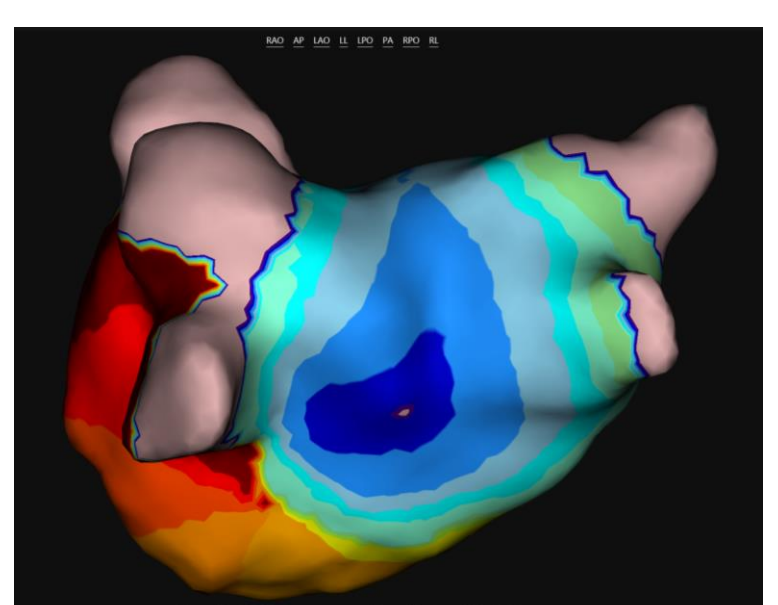
Ultrasound pings the chamber wall



Processed surface anatomy

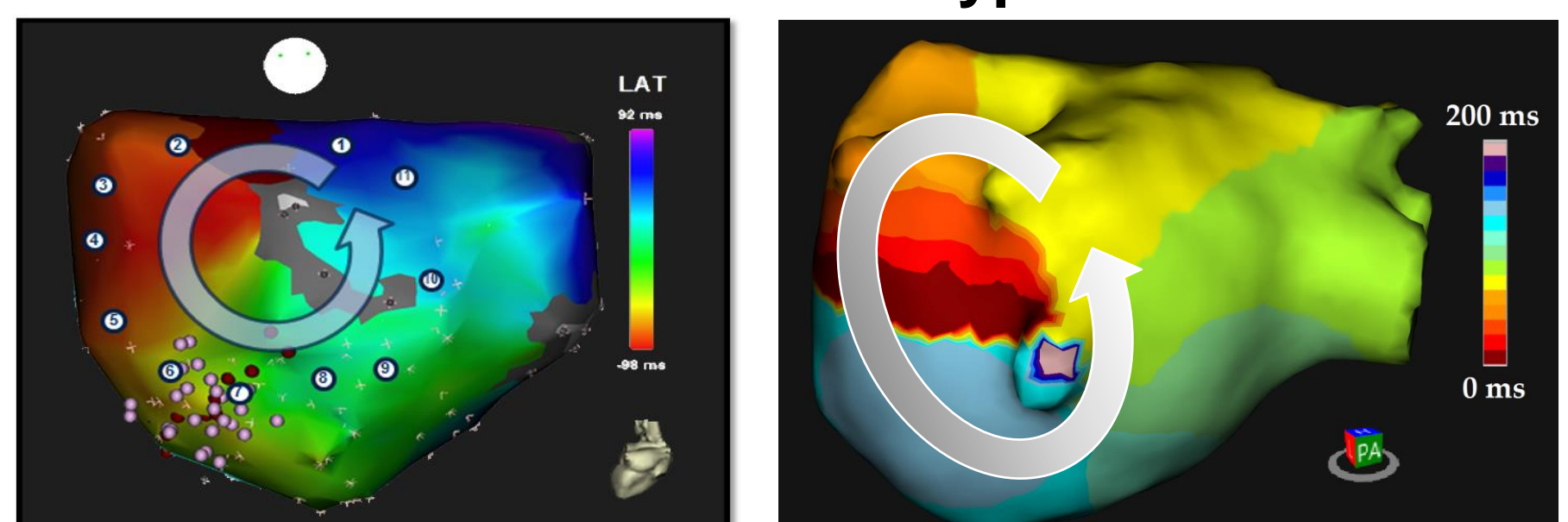


An inverse solution is used to calculate the Dipole Density from the Voltages measured on the basket



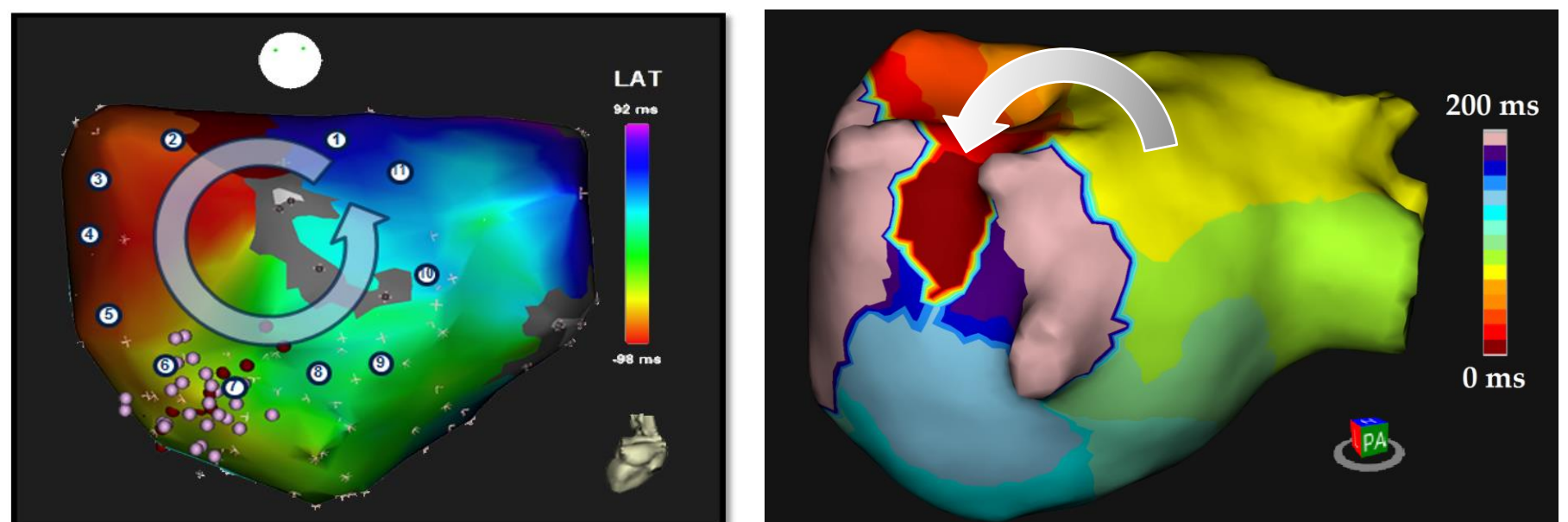
Dipole Density propagation history depicts the leading edge of the wave front in red with trailing color bands showing earlier locations of the wave front

Conventional and Non-contact Voltage maps correlate well in Stable Atypical Flutters



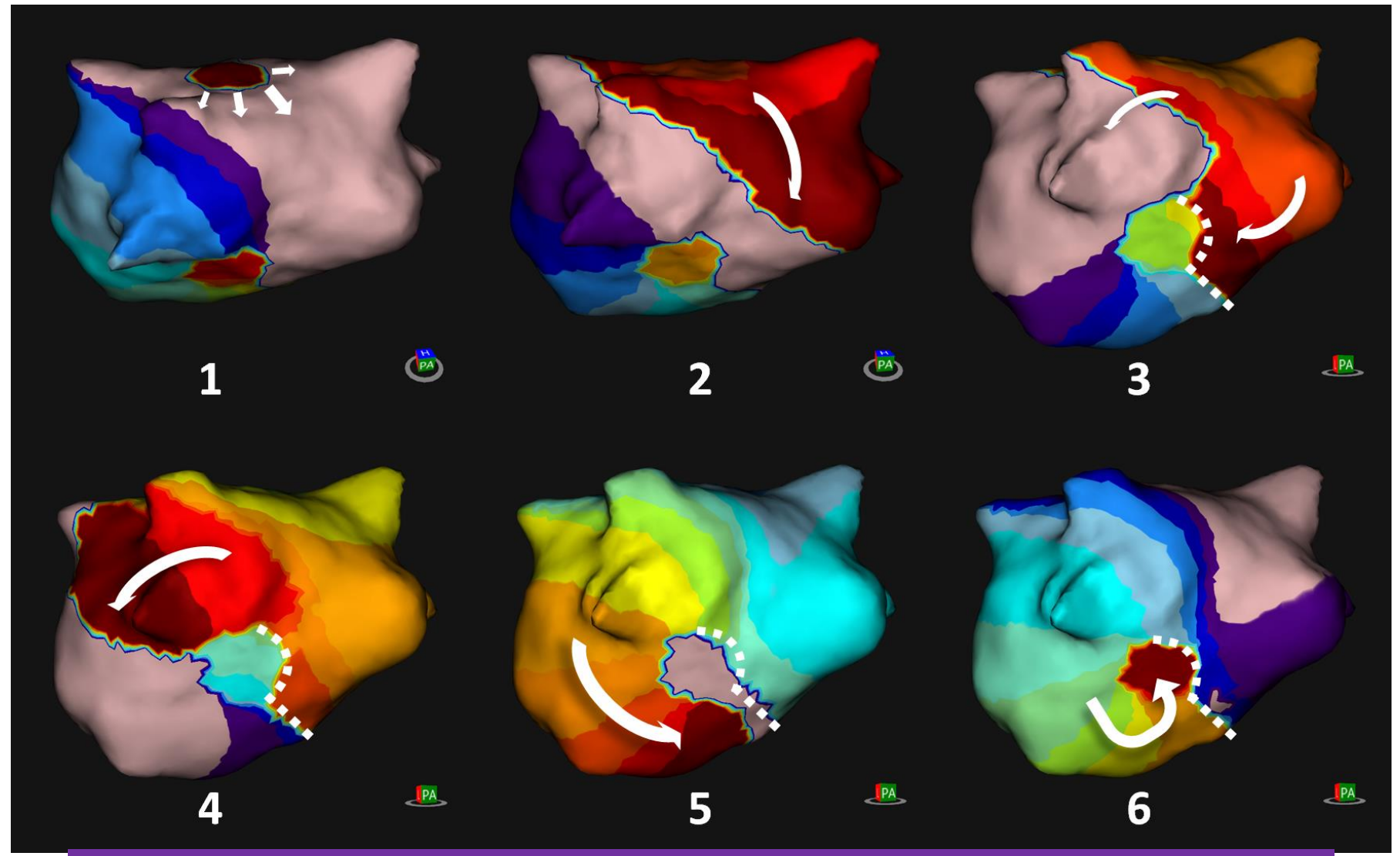
Contact Map (CARTO™) Non-Contact Map (Voltage)

Non-contact Dipole Density mapping reveals details not seen in Conventional Voltage map



Contact Map (CARTO™) Non-Contact Map (Dipole Density)

Example of a Complex, Atypical Flutter which was only mapped with AcQMap



Non-Contact Propagation Map (Derived from Dipole Density)

Results

Patient Demographics

N:	11 subjects	Prior ablation:	64%
Mean:	64.7 ± 5.8 years	Hypertension:	91%
Gender:	64% Male	Dilated CM:	27%
Left atrial size:	49.8 ± 3.5 mm	Prior CVA:	9%
AT/AF Duration:	4.7 ± 4.6 years	Vascular Disease:	9%

Procedural Rhythms

Atypical Flutter	100% (11/11)	CL 312±84ms (range 206-567 ms)
	22 Atypical Flutters	
Atrial Fibrillation	91% (10/11)	

Mapping Results

Patient Number	Rhythm Stability	Contact Mapping	Non-Contact Dipole Density Mapping
1 – 4	Stable atypical flutters*	100%	100%
5 – 11	Unstable atypical flutters; Multiple complex, irregular rhythms	13%	100%

* Good correlation between mapping systems

Conclusions

- In stable rhythm patterns, there was good agreement among all map types.
- In more complex, irregular rhythms, contact mapping was largely unsuccessful, whereas dipole density non-contact mapping successfully identified the pattern for atypical atrial flutters.